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Job stress in young adults is associated with a range of poorer health behaviours in the Childhood Determinants of Adult Health (CDAH) study

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Conflicts of interest

None declared

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Abstract

Objective: To examine job stress and health behaviours, including their co-occurrence, in Australiansaged 31–41 year assessed in 2009-11.

Methods: Cross-sectional analyses using multivariable regression models of the association between the Effort Reward Imbalance (ERI) scaleand health behaviours (smoking, alcohol consumption, diet,physical activityand BMI) bothindividually and co-occurring (0-3 versus 4-5 behaviours) were undertaken. Covariates included sociodemographics, personality and life events.

Results: Greater ERI was associated with a significantly lower prevalence of having co-occurring healthy behaviours and poorer diets in both sexes.Higher ERI was also associated greater physical inactivity and sedentary behaviour in men and smoking, high alcohol consumption and more pedometer-measured physical activity in women.

Conclusion: Job stress at work was associated with a range of unhealthy behaviours, which may explain the higher chronic disease associated with job stress.

Introduction

The adverse effects of job stress on physical and mental diseases have been well investigated, butthe role of health risk behaviours in these associations remains unclear. There is evidence thathealthrisk behaviours account for a large proportion of the adverse effect of job stress on some cardiovascular diseases like coronary artery disease.[1]As such, health risk behaviours may be a target for reducing the effects of job stress on health.

Health risk behaviours differ according to levels of job stress but existing studies have some limitations. Authors for a recent individualparticipantdata meta-analysis that includedover 100,000 people [2]reported that people with higher levels of job stress were more likely to becurrent smokers, consume heavy amounts of alcohol and be less physically active than people with lower levels of job stress,[3] with similar findings reported by others.[45]There has been little investigation of the association between diet and job stress, despite its importance for physical [6-8]and mental[9] health.Most studies ofhealth risk behaviours and job stress have been conducted in Europe, especially in Finland,[3-5] withvery little is known outside this region. Contextual differences in the distributions of risk factors, characteristics of the workforce andsociety could result in different associations between these factors, suggesting that region specific analyses are warranted.

Researchers have tended to examine the association between individual risk factors and job stress. While this is important for understanding potential mechanisms, it disregards that health behaviours commonly co-occur. When they have examined the association between job stress and co-occurring risk behaviours the results have beeninconsistent.[345]Inthe IPD-Work Consortium, investigators foundsimilar associations between job stress andindividual or co-occurring health risk behaviours.[3]In contrast, in the Finnish Public Sector Study, job stress was more stronglyassociated with co-occurring thanindividualhealth risk behaviours.[45].Many studies have lacked information on potentially important factors that might confound associations between job stress and health risk behaviours including major life events (e.g., divorce or illness) [1011] and personality,[1213]as noted by others.[3-5]A better understanding of the extent to which job stress is associated with both individual and co-occuring health behaviours with account for these important confounding factors is important for understanding its links with chronic disease but also for devising interventions to improve workers' health.

The aims of this study were to examine the association between job stress and a suite of health risk behaviours, including their co-occurrence, with adjustment for a wide range of potential confounding factors.

Method

Sample

The Childhood Determinants of Adult Health (CDAH) study is a cohort study that follows up the participants of the 1985 Australian Schools Health and Fitness Survey (ASHFS). The details of sampling and data collection is described elsewhere.[14]This study uses data from the second adult follow-up of ASHFS participants conducted in 2009-11 (CDAH-2) that comprised questionnaire assessments of health risk behaviours and job stress, as specified below. As specified in the participation flow chart (Figure 1), after excluding participants with incomplete job stress information, 1,481 participants were eligible for inclusion although the number in some analyses isless than this due to missing data for some health risk behaviours and covariates.

Measures

Job stress

Job stress in this study was measured with the ERI ratio, using a validated questionnaire thatincluded 17 items (6 effort items and 11 reward items).[15]The effort scale covers workplace interruptions, job responsibility, pressure to work overtime and job demand, while the reward scale covers adequate support, being treated unfairly and adequate gains and reflects employee's responses of esteem, job security and job promotion. Standard scoring was applied to devise scores for effort, reward and the ERI ratioand higher scores indicate higher job stress.

Health risk behaviours

Smoking

Smoking status was measured by standard self-reported questionsregarding current and past smoking history with people defined as 'never smoker' (smoked <100 cigarettes in lifetime), 'ex-smoker' (current non-smoker that was a daily smoker) or 'current smoker' (current weekly or daily smoker).

Body mass index (BMI)

BMI was calculated from self-reported height and weight.A correction factor was applied based on self-report and measured height and weight from an earlier follow-up to give estimates of measured BMI from self-reported values, as previously.[16]BMI was reported into healthy weight(BMI <25 kg/m^2), overweight (25-29.9 kg/m^2) and obese (≥ 30 kg/m^2).

Diet

Participants completed a 127 item food frequency and habits questionnaire. The Dietary Guideline Index (DGI) used for assessing participants' diet quality, based on the Dietary Guidelines for Australian Adults [17]and the Australian Guide to Healthy Eating (AGHE).[18]The DGI reflects the consumption of the 5 core food groups (vegetables, fruits, cereals, meat and alternatives, and dairy) and includes 15 components including whole-grain cereals, fruit and vegetables, lean meat, reduced or low fat dairy, and dietary variety.[19]The DGI score with a potential range of 0-150, a higher score indicates greater compliance with the Dietary Guidelines. This score has been shown to be a valid measure of diet quality[19]and was associated with cardio-metabolic risk factors in Australian adults.[20]We also examinedconsumption of 'extra foods'that are not essential to provide nutrition and typically contain too much fat, sugar and salt.[19,21]Frequency of takeaway food consumption was measured from participants' response to the question, 'how many times per week would you usually eat hot takeaway meals?' with responses ranging from 'I don't eat takeaway' to '6–7 meals per week' and presented as dichotomous variable ('less than twice per week' or 'twice a week or more').[8]

Alcohol consumption

We used two items for measuring alcohol consumption. One measured standard drinks consumed per day from responses to the question: 'On a day, when you drink alcohol, how many standard drinks do you usually have?' with responses being 'none', '1 or 2 drinks per day', '3 or 4 drinks per day' or 'more than 5 drinks per day'. The other estimated the total volume of alcohol (grams/day) consumed in the previous 12 months from the usual frequency of consumption of 10 common types of alcoholic beverages multiplied by the average alcohol concentration of each beverage from the Food Frequency Questionnaire.[22]

Physical activity

The long version of the International Physical Activity Questionnaire (IPAQ-L) was used to assess levels of physical activity. Participants self-reported duration and frequency of leisure time (LTPA), domestic and gardening (DGPA), work-related and transport-related physical activity. We summed the total minutes of LTPA, work related physical activity, DGPA and transport-related physical activity were by multiplying frequency by duration, and then multiplied by the resting metabolic rate to get the MET-minutes/week. Additionally, we summed the total sitting time on weekdays and weekends, respectively. Steps per day were also measured using a YamaxDighwalker SW-200 pedometer worn for seven consecutive days, as described elsewhere.[23]

Co-occurrence of health risk behaviours

We calculated a Healthy Lifestyle Score that is associated with biomedical cardiovascular risk factors [8]and mental health in this cohort [24]and is similar to other scores.[25,26] Our score comprised five 'healthy' items assigned one point each: body mass index (BMI) <25kg/m^2, never smoker or ex-smoker ≥12 months, ≥3 hours of moderate to vigorous leisure time physical activity (LTPA) per week, ≤20 grams of alcohol per day and for indicating a 'healthy' diet, scoring in the 75th percentile of a validated Dietary Guideline Index that assessed adherence to Australian dietary guidelines from a Food Frequency Questionnaire.[27] The total score ranged from zero (no healthy behaviours) to five (all healthy behaviours).

Covariates

Sociodemographic covariates were age, marital status (not married/de facto, currently married/de facto or divorced/widowed/separated), parental status (children or no children), highest level of education attained (secondary schooling only, vocational training or tertiary degree). Work covariates were occupation type (manual, non-manual or professional/managerial), working hours and work schedule (regular daytime, shift work or other). Individual covariates werethe number of adverse life events in the previous five years (e.g. financial difficulties or physical illness) reported by participants,[28] personality assessed by the 60-item NEO Personality Inventory that measures neuroticism, extroversion, agreeableness, openness and conscientiousness,[29]DSM-IV diagnoses of major depression/dysthymia or anxiety from the lifetime version of the Computerised International Diagnostic Interview administered over the telephone [30].

Data analysis

We usedsex-specific log multinomial regression (for variables with three or more categories), log binomial regression (for dichotomous variables) and linear regression (for continuous variables) to estimate associations between the total ERI scale as well as the individual effort and reward scales and the health risk behaviours. We multiplied the ERI ratio by 10 (corresponding to a 0.1unit change on the ERI scale), and divided effort and reward by 5 (corresponding toa 5 unit change in these scales) to aid interpretation.

Extra food consumption, domains of physical activity and total alcohol consumption were log transformed. For domains of physical activitythere were a large number of zeros, so two step analyses were used. First, a binary variablewas created for doing any activity versus none withlog binomial regression used to investigate associations with ERI. Then, linear regression was performed on the amount of activity within the any activity group. In addition to looking at the HLS as a continuous variable, we made categories of low (scores 0 to 2), and high (scores 3 to 5).For daily steps, we categorised people into sedentary (<5000 steps/day), low active(5000-7499 steps/day), somewhat active (7500-9999 steps/day), active (≥ 10000 steps/day) and high active (>12500 steps/day).[31]

We present models that are adjusted for sociodemographic factors, sociodemographic plus work factors; and age, work factors plus individual factors. Purposeful model building was used to select the specific covariates included in each model with factors that satisfied these criteria for any outcome included across all analyses. Previous studiesof job stress and health have tended to include all work and SEP variables in a single model. However, there is a risk that such models are over-adjusted[5] so we did sensitivity analyses testing the effect of each SEP and work characteristic separately.

We used multiple imputation with chained equations and with 30 estimations to impute missing data on covariates. The following variables were used in the imputation model: childhood school academic attainment and smoking status, education level, marital status, sex, age, and state, height, weight and self-rated health from an earlier adult follow-up.

All analyses were conducted with Stata version 12.1 (Statacorp, 2012).

Ethical considerations

The CDAH study was approved by TasmanianHealth and Medical Human Research Ethics Committee and all participantsprovided written informed consent.

Results

The included participants are shown in Figure 1 and theircharacteristics in Table 1.

In men, after adjusting for sociodemographic factors, higher ERI was significantly associated with a lower mean Healthy Lifestyle Score, lower DGI, greater consumption of extra foods, less MET minutes of leisure-time physical activity per week and more minutes of sitting during the weekend (Table 2). After additionally adjusting for work-related and individual factors of personality and life events, the associations persisted between ERI and greater extra food consumption, less MET minutes of leisure-time physical activity per week, more minutes of sitting time during the weekend.In women,after adjustment for sociodemographic factors, higher ERI was associated withlower mean Healthy Lifestyle Scores and higherpedometer steps counts (Table 3).The magnitude of these associationswas similar afterfurther adjustment for work and individual covariates. Associations between weekday sitting time and ERI were completely attenuated by adjusted for work and individual factors.

In men, after adjusting for sociodemographic factors, higher ERI was significantly associated with a lower prevalence of 'high' Healthy Lifestyle Scores, which persisted after additionally adjusting for work-related and individual factors of personality and life events (Table 4). In women,after adjustment for sociodemographic factors, higher ERI was associated witha lower prevalence of a 'high' Healthy Lifestyle Score, a higher prevalence of 'high active' number of steps/day, a higher probability of doing any physical activity in the workplace; being a current smoker, consuming takeaway food twice a week or more and consuming five or more alcohol drinks per day (Table 5).The magnitude of these associations was similar after further adjustment for work and individual covariates but associations for alcohol consumption and any physical activity in the workplace were no longer significant.

Higher levels of effort in men were associated with greater consumption of extra foods and more minutes of sitting during the weekend across all models (Table 1, Supplementary Digital Content, http://links.lww.com/JOM/A397). Higher effort was also associated with lower DGI in men when adjusted for age, but not after adjusting for work or individual factors (Table 1, Supplementary Digital Content, http://links.lww.com/JOM/A397). In women, higher levels of effort were associated with a lower mean Healthy Lifestyle Score, doing more minutes of physical activity in the workplace, and less minutes of transport related physical activity even after adjusting for age, work and individual factors (Table 1, Supplementary Digital Content, http://links.lww.com/JOM/A397). In women, higher levels of effort were also associated with a lower prevalence of a high Healthy Lifestyle Score, a higher prevalence of current smoking and consumption of takeaway foods twice a week or more even after adjusting for age, work and individual factors (Table 2, Supplementary Digital Content, http://links.lww.com/JOM/A397).

Higher levels of reward in men were associated with higher scores on the dietary guideline index, less consumption of extra foods and less time sitting on the weekends independent of sociodemographic factors (Table 3, Supplementary Digital Content, http://links.lww.com/JOM/A397). In women,there was a trend toward a significant association between higher reward and lower body mass index but this was attenuated with adjustment for individual factors (Table 3, Supplementary Digital Content, http://links.lww.com/JOM/A397). Higher levels of reward in men were associated with a trend toward a greater prevalence of a high healthy lifestyle score and a lower likelihood of being a current smoker but did not reach statistical significance in the fully adjusted models (Table 4, Supplementary Digital Content, http://links.lww.com/JOM/A397). In women, higher levels of reward were associated with a lesser likelihood of being a current smoker and consuming takeaway food more than twice per week across all models (Table 4, Supplementary Digital Content, http://links.lww.com/JOM/A397).

Sensitivity analyses looking at the effect of individual markers of SEP and work characteristics showed that working hours were particularly influential on the associations between job stress and behavioural risk factors, particularly physical activity, in women (Tables 5 to 10, Supplementary Digital Content, http://links.lww.com/JOM/A397).

Discussion

Higher job stress was associated with a range of health behaviours, includingless adherence todietary guidelines, lower levels ofleisure time physical activity, more sitting time during weekends, being a current smoker and consuming greater amounts of alcohol.There was also evidence that higher job stress was associated with co-occuring health behaviours. These effects were largely independent of confounding factors, including life events and personality that have not been examined in previous studies. These findings contribute toour understanding of how job stressmight lead to poorer health outcomes and suggest targets to improve the health and wellbeing of workers.

Higher levels of job stress were associated with a greater co-occurrence of health behaviours. The score we used to measure co-occuring health behavioursnot only includedbehaviours previously examined in relation to job stress(e.g. smoking, alcohol, overweight and physical inactivity) but also items about dietwhich have not been considered by other investigators.[45]In support of our finding, Heikkila and colleagues reported that people withhigh job strain were 25% more likely to have four unhealthy behaviours than those without job strain in cross-sectional analyses including over 100,000 people.[3]Kouvonen et al.also found similar findings, with people with high ERI ratios being40%more likely to have three or more unhealthy behaviours independent of sociodemographic factors.[5] Both authors noted they could not account for other important factors, such as personality. Our results confirm that associations between job stress and co-occurring health behaviours remain even after accounting for personality factors.

Job stress may be associated witha greater burden ofunhealthy behavioursas people may engage inthese behaviours to relieve stress related to work.[4] According to the self-medication theory, people engage in unhealthy behaviours to relieve the unfavourable symptoms associated with stress. For example, they might use tobacco, consume 'comfort foods' or drink alcohol to diminish stress from work.[32-36]While engaging in these behaviours might make people feel less stress at the time, they are also associated with higher risk of chronic diseases [3738] and likely explain at least some of the link between job stress and such diseases, as noted by others.[1] Ideally, we would be able to address the causes of job stress to alleviate its effects on health behaviours and outcomes. However, the causes of job stress are complex and influenced by individual and workplace characteristics.[39]There is a potential role for workplace health promotion programs,[40]with there being some evidence that sustained, well designed and implemented programs have benefits on health behaviours [41] and some aspects of job stress.[42]

Higher job stress was also associated with several individual health behaviours. People with higher levels of job stress had a range of poorer dietary behaviours including consuming more extra foods each day, meeting less of the dietary guidelines (in men) and eating more takeaway foods (in women). There are no comparable studies of job stress and diet but studies of general stress support our findings. Theinvestigators for the longitudinal Midlife in the US II study found evidence for an association between higher stress and greater consumption of energy-dense foods,[43] which include takeaway and 'extra foods' measured in our study.In experimental studies, craving for fat, sugar and energy increased during stressful situations and parts of the brainthat control mood, like the meso-limbic dopaminergic brain "reward" system, are activated by eating these types of food.[34]Therefore, people with higher job stress might eat more of these types of food as it reduces their negative emotional responses to stress at work. An alternative hypothesis is that these foods are readily available with this of benefit to 'time poor' workers.[4445]In support of this, women with higher ERI ratios had a higher probability of eating takeaway food twice or more times per week. Long working hours are associated with greater job stress [45]but adjusting for working hours in our models did not change these associations.Therefore, the association between poorer dietary behaviours and job stress are possibly related to the effects of these foods on mood regulation.

Higher ERI was related to lower levels of leisure-time physical activity and more time spent sitting during weekend, with these associations independent of SEP, work factors, personality and life events. The negative association between ERI and less leisure-time physical activityis consistent with findings from a previous study.[46]One mechanism might be that higher job stress is related to excessive fatigue manifesting as more sitting time during the weekends and lower levels of leisure-time physical activity.[47]For women, higher ERI was associated with doing more pedometer-measured steps per day, which is likely linked to the association between greater job stress and greater work-related physical activity. Related to this is the apparent role of long working hours, with sensitivity analyses showing that work hours were particularly important for the association between ERI and physical activity. Long hours at work potentially increase job stress by increasing work-life conflicts [48] and others have noted the need to consider the role of long working hours in the association between job stress and health risk behaviours.[2]There are also possible bi-directional associations between work-related factors and health outcomes, with previous analyses in this cohort showing that people with greater levels of work-related physical activity had a higher risk of depression.[49]

We did not find any association between ERI and BMI in this study.Our results are in agreement with some previous studies that also found no association between job stress and BMI,[5051] but in contrast to another that reported a U-shaped relationship between job stress and BMI.[52]. One reason for the lack of an association in our study is that the levels of job stress were low with only 1.6% of the participants having a ERI ratio higher than the cut-off for high levels of job stress.[53] Similarly, although our cohort had reasonable distribution of different body sizes, most participants were healthy weight or overweight. There were less people that wereunderweight or obese, where the greatest associations with job stress have been demonstrated.[52]We note the longitudinal studies showing that people with higher job stress appear to gain more weight [54] and also that the preponderance of behaviours associated with weight gain in those with job stress in this study (e.g. consumption of energy dense foods and low levels of physical activity) may expose this group to weight gain overtime.

There are some limitations of this study. This study is cross-sectional and therefore we cannot draw any conclusions about causality. Our measures were mostly self-reported, with the exception of pedometers. This may contribute to misclassification of some health risk behaviours; however, all measures we used were validated. Although this study wasa national study, the sample was not fully representative of the working population and this may limit the generalizability of these findings.In line with this, thelevels of jobs stress were lowmeaningand our findings might not betransferable to other contexts where there are higher levels of job stress.

The present study also has several strengths. Ours is the first study to examine the full ERI model in relation to co-occurrence of personal health risk behaviours and a range of dietary behaviours. We controlled for often missedconfounders (reference to the paper that said people should account for these things), such as life events and personality. We concluded that while these were associated with both job stress and health risk behaviours, they did not appear to be confounders or mediators of the association between these two factors. Finally, the present study focuses on a national cohort of Australians, whereas most previous studies have been focused on European populations.

In conclusion, higher ERI was associated with poorerhealth risk behavioursindependent of SEP, work factors, life events and personality. Our findings support those of others that suggest job stress may lead to poorer health outcomes via such health behaviours.

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Figure legends

Figure 1. Participants in the CDAH study

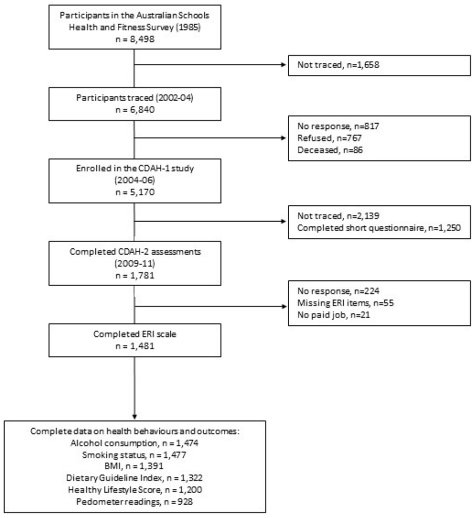

Table 1. Characteristics of employed men and women aged 31 to 41in the CDAH-2 study

	Men		Women	
	n		**n**	
Mean (SD) years of age	618	36.8(2.5)	863	36.5 (2.6)
Marital status, %				
Single	86	14%	135	16%
Married/living as married	514	83%	675	78%
Other	18	3%	53	6%
Parental status,%				
No children	188	31%	257	30%
Children	418	36%	589	70%
Education, %				
High school	108	18%	461 (54)	54%
Vocational training	230	37%	219 (26)	26%
Tertiary	108	18%	172 (20)	20%
Occupation, %				
Professional/managerial	426	69%	546 (64)	64%
Non-manual	38	6%	254 (30)	30%
Manual	152	25%	54 (6)	6%
Mean (SD) working hours/week	618	47.4 (12.8)	857	34 (16.0)
Work schedule, %				
Regular daytime	484	79%	686 (80)	80%
Shift work	49	8%	61 (7)	7%
Irregular	57	9%	80 (9)	9%
Other	26	4%	36 (4)	4%
Alcohol consumption, %				
None	55	9%	113	13%
1-2 drinks per day	228	37%	491	57%
3-4 drinks per day	191	31%	180	21%
≥5 drinks per day	141	23%	75	9%
Smoking status, %				
Never	375	61%	499	58%
Ex-smoker	140	23%	250	29%
Current smoker	101	16%	112	13%
BMI category, %				
Normal (<25 kg/m^2)	222	37%	456	58%
Overweight (25-29.9 kg/m^2)	284	37%	196	25%
Obese (≥30 kg/m^2)	100	17%	133	17%
Mean (SD) Dietary Guideline Index	590	99.5(19.3)	805	108.8(17.2)
Mean (SD) Leisure-time physical activity MET mins/week	551	976.9(1279.1)	801	872.3(1031.3)
Mean (SD) Work physical activity MET mins/week	551	1474.9(2176.9)	801	692.8(1292.6)

	Men		Women	
	n		n	
Mean (SD) Householdphysical activity MET mins/week	551	797.2(862.5)	801	1106.5(1017.5)
Mean (SD) Transport physical activity MET mins/week	551	434.4(640.4)	801	316.6(488.4)
Mean (SD) weekend sitting time (minutes)	610	272.0(175.0)	848	242.9(146.0)
Mean (SD) Weekday sitting time (minutes)	611	363.7(217.1)	848	337.3(192.6)
Healthy lifestyle score, %		5.3(1.5)		5.9(1.4)
Low (scores 0 to 3)	385	78%	438	62%
High (scores 4 to 5)	111	22%	266	38%
Mean (SD) pedometer steps per day*	392	8844 (3277)	536	8565 (3072)
Pedometer steps per day, %				
Sedentary lifestyle	33	8%	61	11%
Low active	119	30%	148	28%
Somewhat active	122	31%	157	29%
Active	65	17%	122	23%
High active	53	14%	48	9%
Effort Reward Imbalance scale				
Mean (SD) effort	618	12.0 (3.5)	863	10.9 (3.6)
Mean (SD) reward	618	49.3 (5.8)	863	49.8 (5.4)
Mean (SD) ERI ratio	618	0.5(0.2)	863	0.4(0.2)

BMI: Body Mass Index, SD: standard deviation, ERI: Effort Reward Imbalance; MET: metabolic equivalent of task

Table 2. Associations in men between a 0.1 unit increment on the ERI scale and continuous measures of health risk behaviours

	Covariates included in multivariable model					
	Sociodemographic factors		**Sociodemographic and work factors**		**Sociodemographic, work, and individual factors**	
Outcomes	**β**	**95%CI**	**β**	**95%CI**	**β**	**95%CI**
Total healthy life score (per unit)	**-0.05**	**(-0.10, -0.99)**	-0.05	(-0.10,0.002)	-0.03	(-0.09,0.02)
Dietary Guideline Index	**-1.03**	**(-1.83,-0.23)**	**-0.90**	**(-1.69,-0.10)**	-0.72	(-1.52,0.08)
Extra foods consumption (per serve)	**0.20**	**(0.08,0.32)**	**0.18**	**(0.06,0.30)**	**0.15**	**(0.03,0.27)**
Leisure-time PA MET mins/week *	**-50.21**	**(-93.40, -7.03)**	**-49.73**	**(-94.47, -4.99)**	**-56.68**	**(-101.82, -11.55)**
Work PA MET mins/week *	37.17	(-56.03,118.37)	28.19	(-41.15, 97.54)	32.71	(-38.73, 104.14)
Household PA MET mins/week*	-8.94	(-34.57,16.70)	-10.78	(-36.88,15.32)	-11.90	(-38.37,14.57)
Transport PA MET mins/week*	15.43	(-13.13,44.00)	8.35	(-20.19,36.89)	9.87	(-19.58,39.32)
Weekday sitting time (minutes)	2.32	(-6.51,11.14)	5.50	(-2.79,13.79)	4.16	(-4.17,12.50)
Weekend sitting time (minutes)	**12.60**	**(5.44,19.76)**	**14.75**	**(7.44,22.06)**	**13.74**	**(6.33,21.15)**
Total alcohol consumption, gram/day	0.08	(-0.29,0.45)	-0.01	(-0.38,0.36)	-0.03	(-0.40,0.34)
Pedometer steps per day	-34.20	(-192.89, 124.49)	-71.99	(-229.35, 85.38)	-75.68	(-234.94,83.57)
Body mass index (kg/m^2)	0.05	(-0.13, 0.22)	0.01	(-0.17, 0.19)	-0.02	(-0.21, 0.16)

	Covariates included in multivariable model					
	Sociodemographic factors		**Sociodemographic and work factors**		**Sociodemographic, work, and individual factors**	
Outcomes	**β**	**95%CI**	**β**	**95%CI**	**β**	**95%CI**

Bolded values are $p<0.05$. CI: confidence interval; MET: metabolic equivalent of task; PA: physical activity. *among those participants did any activity.

Table 3. Associations in women between a 0.1 unit increment on the ERI scale and continuous measures of health risk behaviours

	Covariates included in multivariable model					
	Sociodemographic factors		**Sociodemographic and work factors**		**Sociodemographic, work, and individual factors**	
Outcomes	**β**	**95%CI**	**β**	**95%CI**	**β**	**95%CI**
Total healthy life score (per unit)	**-0.05**	**(-0.09,0.001)**	**-0.08**	**(-0.13,-0.03)**	**-0.06**	**(-0.11,-0.01)**
Dietary Guideline Index	-0.14	(-0.77,0.49)	-0.23	(-0.87,0.42)	-0.09	(-0.74,0.57)
Extra foods consumption	-0.01	(-0.08,0.07)	0.03	(-0.05,0.11)	0.02	(-0.06,0.09)
Leisure-time PA MET mins/week *	-6.02	(-42.08,30.04)	-31.65	(-69.51,6.21)	-28.85	(-66.10, 8.40)
Work PA MET mins/week *	19.09	(-29.92,68.10)	30.17	(-16.32,76.66)	25.82	(-21.56,73.20)
Household PA MET mins/week*	1.32	(-28.58,31.23)	25.64	(-6.04,57.32)	22.83	(-9.33,55.00)
Transport PA MET mins/week*	-7.41	(-25.71,10.89)	-18.18	(-36.81,0.45)	**-19.00**	**(-37.70,-0.31)**
Weekday sitting time (minutes)	**7.36**	**(0.45,14.27)**	0.01	(-6.90, 6.91)	0.27	(-6.76,7.30)
Weekend sitting time (minutes)	0.79	(-4.45,6.03)	0.06	(-5.45,5.56)	-0.02	(-5.60,5.57)
Total alcohol consumption, gram/day	0.16	(-0.08,0.41)	0.06	(-0.20,0.31)	0.04	(-0.22,0.29)
Pedometer steps per day	**145.81**	**(15.48,276.15)**	**167.56**	**(32.84, 302.28)**	**179.23**	**(42.54, 315.92)**
Body mass index (kg/m^2)	0.09	(-0.14, 0.32)	0.15	(-0.09, 0.41)	0.12	(-0.12, 0.37)

Bolded values are p<0.05. CI: confidence interval; MET: metabolic equivalent of task; PA: physical activity. *among those participants did any activity.

Table 4. Associations in men between a 0.1 unit increment on the ERI scale and categorical measures of health risk behaviours

	Covariates included in multivariable model					
	Sociodemographic factors		Sociodemographic and work factors		Sociodemographic, work and individual factors	
Outcome	**PR**	**95%CI**	**PR**	**95%CI**	**PR**	**95%CI**
Healthy lifestyle score						
Low (0 to 3)	Ref.		Ref.		Ref.	
High (4 to 5)	**0.89**	**(0.80, 0.99)**	**0.89**	**(0.80, 0.99)**	**0.90**	**(0.81, 1.00)**
Smoking status						
Never	ref.		ref.		ref.	
Ex-smoker	0.99	(0.90,1.08)	0.98	(0.89,1.07)	0.99	(0.90,1.08)
Current smoker	1.02	(0.92,1.12)	1.02	(0.92,1.13)	0.98	(0.88,1.09)
Alcohol consumption						
None	ref.		ref.		ref.	
1-2 drinks per day	1.02	(0.99,1.06)	1.01	(0.96,1.05)	1.05	(0.98,1.13)
3-4 drinks per day	0.98	(0.92,1.04)	0.98	(0.91,1.05)	0.95	(0.88,1.02)
≥5 drinks per day	1.00	(0.93,1.07)	1.01	(0.93,1.10)	1.01	(0.92,1.10)
Take away food consumption/week						
1 or less	ref.		ref.		ref.	
2 or more	1.05	(0.98,1.13)	1.05	(0.97,1.13)	1.04	(0.96,1.12)
Leisure-time PA MET mins/week						
Inactivity	ref.		ref.		ref.	
Any activity	0.98	(0.93,1.04)	0.99	(0.93,1.04)	0.99	(0.93,1.04)
Work PA MET mins/week						
Inactivity	ref.		ref.		ref.	
Any activity	**1.05**	**(1.00,1.11)**	1.05	(1.00,1.11)	1.05	(1.00,1.11)
Household PA MET mins/week						
Inactivity	ref.		ref.		ref.	
Any activity	1.01	(0.96,1.06)	1.02	(0.97,1.07)	1.02	(0.97,1.07)
Transport PA MET mins/week						
Inactivity	ref.		ref.		ref.	
Any activity	0.96	(0.90,1.02)	0.96	(0.90,1.03)	0.96	(0.90,1.02)
BMI						
Normal	ref.		ref.		ref.	
Overweight	1.01	(0.97,1.06)	1.01	(0.96,1.06)	1.02	(0.97,1.07)
Obese	1.03	(0.93,1.13)	1.02	(0.92,1.13)	1.00	(0.91,1.11)
Pedometer steps per day						
Sedentary lifestyle	1.00	(0.86,1.16)	1.01	(0.86,1.18)	1.00	(0.84,1.18)
Low active	1.01	(0.95,1.08)	1.02	(0.95,1.09)	1.03	(0.96,1.10)
Somewhat active	ref.		ref.		ref.	
Active	1.01	(0.92,1.11)	1.01	(0.92,1.12)	1.00	(0.89,1.11)

	Covariates included in multivariable model					
	Sociodemographic factors		**Sociodemographic and work factors**		**Sociodemographic, work and individual factors**	
Outcome	**PR**	**95%CI**	**PR**	**95%CI**	**PR**	**95%CI**
High active	0.94	(0.82,1.07)	0.90	(0.79,1.04)	0.94	(0.82,2.27)

Bolded values are p<0.05.

CI: confidence interval; RR: risk ratio; BMI: body mass index; LTPA: leisure time physical activity; DGPA: domestic and gardening physical activity.

Table 5. Associations in women between a 0.1 unit increment on the ERI scale and categorical measures of health risk behaviours

	Covariates included in multivariable model					
	Sociodemographic factors		Sociodemographic and work factors		Sociodemographic, work and individual factors	
Outcome	**PR**	**95%CI**	**PR**	**95%CI**	**PR**	**95%CI**
Healthy lifestyle score						
Low (0 to 3)	Ref.		Ref.		Ref.	
High (4 to 5)	0.95	(0.87, 1.01)	**0.91**	**(0.84, 0.98)**	**0.92**	**(0.86, 0.99)**
Smoking status						
Never	ref.		ref.		ref.	
Ex-smoker	0.96	(0.89,1.03)	0.97	(0.89,1.05)	0.97	(0.89,1.06)
Current smoker	**1.23**	**(1.15,1.31)**	**1.28**	**(1.17,1.41)**	**1.30**	**(1.19,1.42)**
Alcohol consumption						
None	ref.		ref.		ref.	
1-2 drinks per day	0.98	(0.94,1.01)	0.98	(0.94,1.02)	0.98	(0.94,1.03)
3-4 drinks per day	0.99	(0.92,1.07)	0.98	(0.89,1.07)	0.96	(0.86,1.06)
≥5 drinks per day	**1.16**	**(1.06,1.27)**	1.10	(0.99,1.23)	1.15	(0.99,1.34)
Take away food consumption/week						
1 or less	ref.		ref.		ref.	
2 or more	**1.11**	**(1.06,1.17)**	**1.12**	**(1.06,1.18)**	**1.10**	**(1.04,1.17)**
Leisure-time PA MET mins/week						
Inactivity	ref.		ref.		ref.	
Any activity	0.98	(0.94,1.03)	0.98	(0.93,1.03)	0.98	(0.93,1.03)
Work PA MET mins/week						
Inactivity	ref.		ref.		ref.	
Any activity	**1.04**	**(1.00,1.09)**	**1.05**	**(1.00,1.09)**	1.04	(0.99,1.09)
Household PA MET mins/week						
Inactivity	ref.		ref.		ref.	
Any activity	1.00	(0.96,1.04)	1.00	(0.96,1.04)	1.00	(0.96,1.04)
Transport PA MET mins/week						
Leisure-time PA MET mins/week	ref.		ref.		ref.	
Inactivity	0.98	(0.93,1.03)	0.98	(0.92,1.03)	0.97	(0.92,1.03)
BMI						
Normal	ref.		ref.		ref.	
Overweight	0.97	(0.90,1.06)	0.99	(0.92,1.08)	1.00	(0.92,1.08)
Obese	1.04	(0.95,1.14)	1.04	(0.94,1.14)	1.01	(0.92,1.11)
Pedometer steps per day						
Sedentary lifestyle	0.96	(0.81,1.15)	0.93	(0.76,1.13)	0.91	(0.74,1.12)
Low active	1.02	(0.93,1.12)	1.00	(0.90,1.11)	0.99	(0.89,1.10)
Somewhat active	ref.		ref.		ref.	

	Covariates included in multivariable model					
	Sociodemographic factors		Sociodemographic and work factors		Sociodemographic, work and individual factors	
Outcome	**PR**	**95%CI**	**PR**	**95%CI**	**PR**	**95%CI**
Active	0.97	(0.86,1.08)	0.97	(0.85,1.10)	0.98	(0.87,1.12)
High active	**1.23**	**(1.06,1.44)**	**1.40**	**(1.18,1.67)**	**1.46**	**(1.22,1.75)**

Bolded values are p<0.05.

PR: prevalence ratio; CI: confidence interval; MET: metabolic equivalent of task; PA: physical activity. *among those participants did any activity.